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## CONSTRUCTION OF THE INTER-AMERICAN HIGHWAY

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HIGHWAY DIVISION

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# CONSTRUCTION OF THE INTER-AMERICAN HIGHWAY

E. W. James

The Pan American Highway System when first developed as an integrated concept was almost unique. The word concept is used rather than Plan, because, although very briefly described, it was little more than an idea. The system was to comprise, according to this description, a net of international roads reaching all the capitals of the Latin American Republics, and suitable for motor vehicle traffic. It was unique because at the time the resolution was adopted, at Santiago, Chile, in 1923, at the third Pan American Highway Congress, there existed almost no national highway systems on which an international road system could be based. A few fragmentary groups of roads existed around the largest towns and cities of some countries, but in many nothing better than "caminos de herradura" formed the principal and local means of highway communication. A "camino de herradura" is a pack-animal trail. This condition did not appear to be too much of an inconvenience or hardship in most regions because pack animals were generally plentiful, everybody rode, and the mountainous terrain made such transportation customary and handy. It is said that in at least two of the Republics, Columbia and Guatemala, there were few if any wheeled vehicles except the carriages of the wealthy in the larger cities. Under such conditions overland highway transport passed from the pack animal or the human carrier directly to the motor vehicle without transition through other forms of conveyance.

Under such conditions it is obvious that laying out a far-flung system of international roads between the national capitals was a very different task from that of selecting, for example, the Federal Aid Highway System in the United States where by law or use a system of wagon roads existed in every state at the time the Federal Aid System was first laid out.

The Latin American conditions were also strikingly different from those existing in Europe where national systems generally existed in a well developed form, although no attempt to correlate them into an international system was consciously attempted until 1949. In that year an ad hoc committee under the United Nations organizations designated in Europe a system of international routes, as reported in Transport & Communications Review, Vol. III, No.4, Page 1.

The first work on a deliberate engineering basis to determine a part of the Pan American Highway System was authorized by the U. S. Congress in 1929, when funds were provided for a reconnaissance survey for an international highway or highways between North and South America. This section was referred to in the Legislation as the Inter-American Highway and this reference has served ever since to give name to that part of the Pan American Highway System between the United States and Panama.

The authorized reconnaissance was started in 1930 and was completed and reported in detail in 1934. The party was instructed to use so far as practicable existing roads, which, perhaps under the urge explicit in the Santiago resolution, had been planned or constructed in some of the respective countries. Mexico had commenced construction in 1926 on the section

between Nuevo Laredo, opposite Laredo, Texas, and Monterrey, although the line through to Mexico City was not finally determined until some years later, and the entire road to Mexico City was not opened until July 4th, 1936. Panama had also started work on the Central Highway in that country, but the line was not through to David until about the time the reconnaissance was started. In Costa Rica and El Salvador a few kilometers of very centrally located roads had been planned or completed.

An idea of the international facilities for overland transportation about 1930, among the eight Republics on the line of the Inter-American Highway, may be had from the fact that at that time the common frontier of Mexico and the United States was open to commercial traffic by both rail and highway. The common frontier of Mexico and Guatemala had railroad facilities of a sort. A standard guage road on the Mexican side and a narrow guage road on the Guatemala side had rail heads about 3 miles apart, with an intervening river at the international boundary that varied from 500 to 1,000 feet wide according to the stage of the river.

Freight was unloaded at Mariscal, on the Mexican railroad, hauled in bull-carts or trucks to the Suchiate River, transported in dug-out canoes or on rafts to the opposite side, and again hauled in carts to the Ayutla Station of the International Railways of Central America. Passengers walked, waded the river or crossed on a cat-walk of sapling poles and plank, or were conveyed in dug-outs. The crossing of the frontier for passengers always required at least 24 hours, and it was necessary to remain over night either in Suchiate or Ayutla. At one time passenger transit of the frontier required eight distinct inspections usually in different buildings or at different points in the crossing.

About 1930 the Zacapa-Santa Lucia branch of the I.R.C.A. was completed, thus providing commercial rail transportation between Guatemala and El Salvador. Thus, about 1930, three common frontiers of the seven existing between the United States and Panama were open to traffic. This condition existed unchanged until 1943 when advancing construction on the Inter-American Highway opened two more frontiers - El Salvador - Honduras, and Honduras - Nicaragua. At the moment, highway transport under good conditions is possible along the Inter-American Highway at four of the seven frontier crossings. The three remaining to be opened are Mexico - Guatemala, and the two, North and South, frontiers of Costa Rica.

The reconnaissance of the highway in Mexico followed generally the Atlantic watershed, both in the flat areas of the Rio Grande Valley and through the mountains both North and South of Mexico City. Below Mexico, the line selected either followed the mountain highlands or adhered to the Pacific watershed with little deviation.

To make a reconnaissance through such long distances as were involved without the aid of aerial photography is almost impossible, if the work is to be done in a reasonable time, at reasonable cost, and even a good line, though not the best, is to be determined. In 1930 when the work was started aerial photography for highway purposes was in its earliest infancy. It would take too much space to describe how aerial photography was used in the overall reconnaissance of the Inter-American Highway in this paper. It was used, however, to excellent advantage, but with a wide and miscellaneous assortment of scales, some large blanks due to smoke or weather interference, and a full description of how the data were used may be found reported in the Journal of the American Geographical Society of New York, in a joint article by myself and D. Tucker Brown, who was in charge of the ground field work. The use of such material at that time presented a very special problem.

At the time the reconnaissance was made, economic data of all kinds including distributed population were seriously deficient, and from the point of view of engineers from the United States, strangely so. During the last 20 years much progress has been made in census techniques and recording throughout Latin America, but even at this moment economic groups working under the technical organizations of the United Nations are finding it difficult to appraise specific economic conditions in many countries. As late as 1939 at the Pan American Highway Congress held at Santiago, Chile, a resolution to classify highways by broad definitions of the status of improvement, such as (1) paved roads, (2) all weather roads, (3) dry weather roads, (4) trails, was rejected because it would apparently disturb the good showing in the public records of some countries.

In spite of these conditions the reconnoitred line finally submitted to the several governments for approval and adoption has been justified by later data and developments. Soon after the publication of the report in January, 1934, a population distribution laboriously made by Professor Stidgenbaner of Detroit, and reported at the annual meeting of the Association of Geographers became available, and it was apparent when our proposed line was plotted on the spot map of population that we had, so far as population was a criterion, projected a thoroughly sound line.

Subsequently, numerous changes have been suggested but on investigation most of these have been rejected by the authorities concerned. Only three important changes in the reconnaissance line have been made, two of which are definitely the result of major economic developments occurring since 1938.

The first cooperative construction was started in 1935 and continued until about 1939. This work was to demonstrate modern road and bridge work to the Highway Departments and Administrative officials of the countries in Central America and the items selected for the purpose were so located as to become immediately useful as integral parts of the route. Some 14 bridges were constructed and about 50 miles of road. The bridges were located where river crossings existed which were entirely interrupted at times of high water during the seven months of the rainy season prevailing throughout the area. Road sections were built where especially troublesome drainage or soil conditions were present and their correction would act to encourage the local road authorities.

Standards of design and construction adopted raised exactly the same financial problem, that modern highway building in any undeveloped country must raise in these days. Construction adequate for the days of the horse and buggy, or the bull cart, will no longer serve even when the improvement raises the standard from most primitive conditions. There is no intermediate point at which to halt the design short of a hard surfaced, two land road, good in all conditions of weather for motor vehicle traffic, heavy in weight, though not necessarily heavy in density.

In this connection it is interesting to note the difference in the composition of traffic practically throughout Latin America as contrasted with the composition of traffic familiar to engineers in the United States. With us a traffic count will usually develop 17 to 21% vehicles in the truck classification and about 80% passenger cars. Say a 20 - 80 composition. In Latin America on practically all rural roads open to motor traffic the composition is almost exactly reversed, with 80% truck class and 20% passenger cars. This relation holds generally except near large cities or between large cities relatively near together. Even on such roads the truck class seldom drops below 50%.

The last count I personally made was on the main road from Caracas to La Guayra, its port of entry, in Venezuela. The length of road is about 38 kilometers, La Guayra is the principal port and near La Guayra lies Maiquetia Airport, the principal national and international airfield in Venezuela. The presence of the airport undoubtedly serves to increase the passenger car count as well as slightly to increase the bus count. The highway, until recently, has been paralleled by a semi-moribund railroad that at the time I made the count must have reduced the potential truck traffic somewhat. In a period of one hour and fifteen minutes I counted one way traffic at 240 vehicles, and at count 180 the composition was exactly 50-50%. This count disclosed roughly 4000 vehicles in both directions in a ten hour day, of which 2000 vehicles are in the truck class.

This difference in composition of traffic is significant in connection with design and selection of types. For instance a rural road carrying only 100 vehicles a day must be designed as would a road carrying 400 vehicles a day in the United States. A road near or between large cities carrying 1000 vehicles a day must be designed as would a road carrying 2500 vehicles a day in the States.

This state of affairs emphasizes the economic and financial difficulties encountered in the highway construction in undeveloped countries in these days.

The standards used throughout Central America and Panama for surveys and design are closely akin to corresponding standards in the States. Right-of-way is now prescribed as 100 meters in rural and 50 meters in municipal sections, where practicable. This is a new requirement and is going to be honored probably as much in the breach as in the practice. Under earlier construction we secured usually 30 to 50 meters and for hundreds of kilometers the road is graded, all structures are in, base is laid and in service as an all-weather road. When we restore or strengthen the base as we probably shall have to do, and lay a bituminous surface, it will hardly be practicable to insist on widening the right-of-way from 30 to 100 meters for this purpose.

Design standards for curvature and gradients are covered in the following table:

Standards to be used are governed by one of the following speed classifications which shall be established within definite limits for all portions of the highway by the resident engineer.

## ADEQUATE FOR 200 CARS PER DAY

| Design Speed | Widths: Surface of Pavement | Widths: Subgrade Shoulder | Curve Widening | Horizontal Curves: Open | Horizontal Curves: Blind | Min. Spiral Length | Vertical Curves: Apex | Vertical Curves: Sag | Super Rate % |
|---|---|---|---|---|---|---|---|---|---|
| 40 Kph<br>25 Mph | 6 Meters | 8 Meters | 1.3 M | 114° | 94° | 40 M | 12xA<br>42° | 6xA<br>84° | 12 x D |
| 50 Kph<br>30 Mph | 6 Meters | 8 Meters | 1.1 M | | 78° | 50 M | 15xA<br>34° | 8xA<br>68° | 18 x D |
| 70 Kph<br>40 Mph | 6 Meters | 8 Meters | 0.9 M | | 45° | 50 M | 25xA<br>21° | 13xA<br>42° | 32 x D |
| 80 Kph<br>50 Mph | 6 Meters | 8 Meters | 0.8 M | | 29° | 60 M | 40xA<br>13° | 20xA<br>26° | 50 x D |
| 100 Kph<br>60 Mph | 6 Meters | 8 Meters | 0.7 M | | 19° | 70 M | 60xA<br>9° | 30xA<br>18° | 70 x D |

Note: D = degree of metric curve
A = algebraic difference in gradients

Maximum superelevation 10%.

No tangent distance between curves in opposite directions required.

Tangent distances of less than 150 meters between curves in the same direction require special approval.

Grades of 8% not exceeding 200 meters may be used on approval.

Vertical curves flatter than the standard shall not be used if additional quantities are involved.

Roadway ditches; minimum: Width - 1 meter, Depth - 0.5 meter.

Widen fill sections 10% of shoulder height to a maximum of 2 meters.

Slopes: Cuts: 0 to 1 meter 1-1/2 : 1 Fills under 1 meter 4 : 1
1 to 4 meters 1 : 1 Fills over 1 meter 1-1/2 : 1
4 to 8 meters 3/4 : 1
Over 8 meters 1/2 : 1

Curve widening:

| Degree of curve | Widening |
|---|---|
| 10 to 19° | 0.7m. |
| 20 to 29° | 0.8m. |
| 30 to 45° | 0.9m. |
| 46 to 78° | 1.1m. |
| 79 to 94° | 1.3m. |
| 95 to 114° | 1.5m. |

The differences in the character of the terrain are great. The coastal plain is often very flat and prairie like; the piedmont or rolling section very

narrow or practically lacking; and the mountainous area is often entered with disconcerting abruptness. The mountain slopes throughout the Andean region are those of a relatively young geological formation and consequently are steep. Eroded forms are sharp and not rounded. In the mountains, slopes of 45° are common and in Colombia even steeper surfaces are encountered. In such terrain slides are to be expected when the natural surface is disturbed.

Much of the area south of Mexico, is composed of volcanic or lateritic soils and some of these, like loess, will withstand better the action of weather when cuts are left with steep or almost vertical sides. Nevertheless, bad slides are to be expected because much of the volcanic deposits are of light weight and extremely porous. Ground water accordingly causes free movement of fill slopes and this can be retarded only by interrupting ground water accumulation by berm ditches, blind drains, and planting.

On the sections of the Inter-American Highway where work has been heaviest there has been considerable sliding but in from 3 to 5 years the new slopes are generally stabilized against normal weather conditions.

In connection with the physical construction no serious difficulties have been encountered, but there have been many minor and annoying ones. As might be expected transportation has until very recent years been troublesome and has required careful and informed handling.

When the Choluteca suspension bridge was built a good stone quarry was located about three miles from the bridge site on the river bank. The river was typical of tropical streams in the region, with enough water in the dry season to float a canoe and a torrent after the heavy rains in the mountains during the rainy season. Quarry blocks for piers and anchorages were brought down the river in hollow log canoes and cut in stone yards located on each side of the stream. Regular ashlar was used with stones finished on five sides. The depth of stones from face to back was random from 12 to 16 inches and above the water line no forms were necessary. Usually six courses were laid up all around and the concrete filler then was poured.

This Choluteca Bridge was a double suspension structure with 3 towers, and has a total length of 880 feet. Wire strand cables were used for ease of transportation. All the steel had to be unloaded over ship-side at Amapala, Honduras, into open barges, towed about 26 miles to San Lorenzo on the mainland, jacked up and loaded on trucks or bull carts, then hauled 36 miles to the bridge site. Steamers equipped with facilities for heavy lift, above 2 long tons, were at that time seldom available along the West Coast of Central America and all steel including cable reels were kept down to standard lift. The only exceptions were the six tower bottom sections which could not advisedly be cut below 7 tons. To handle these, the shipments were timed to take advantage of a heavy lift ship.

For a time the handling of oil products promised to present special difficulties, because both stationary and portable tankage was not available. The coming of war in 1939 corrected this and we were able by postponing black top work to avoid the anticipated trouble in handling liquids.

In road construction we met with bad soils that bothered us for a time. The entire region through which we were building was composed of volcanic and lateritic soils. Some of the volcanic deposits are excellent material being burned, vitrious and non-slaking. Clinker, scoria and lava may be highly porous but this did not bother us because there is never any ground frost. In Nicaragua, Costa Rica, Guatemala and sometimes in Panama, however, we found an extreme form of gumbo known in Nicaragua by the Indian

name of Sonsocuite. In its natural state underground and water saturated it has a consistency reminding one of liver. It is so fine grained it resists evaporation except for a thin layer at the surface where it dries out hard. Its shrinkage is high but the lozenges into which it cracks are rather large owing to the tenacious plasticity of its interior. The sides of the cracks, reached by the air caseharden just as the surface does. To stabilize such a soil by admixtures is practically impossible. Our soil engineers advised us that it would take 90% admixture to give it stability and probably nothing short of breaking it up into small blocks, drying and pulverizing it would make it possible to mix with sand or other good volcanic material. In some places along the shores of Lake Nicaragua it occurs in deposits six to fourteen feet deep for a distance of several kilometers. To relocate to avoid it was not desirable because we wish to serve the towns along and near the lake shore, and to remove it was impracticable. We did the next obvious thing and tried to blanket it. This we succeeded in doing by raising the thickness of the blanket of the best select material we could find from six progressively to 18 inches. By carrying the blanket down the slopes we finally have secured a grade that promises to remain stable.

Another troublesome detail about Sonsocuite is that it sometimes occurs in cuts in the form of small lenses, tapering out to nothing in a short distance. Before our experience was complete we neglected these small deposits and mingled them with the surrounding good soils in the process of grading. The result, as one might conclude from the soil engineer's statement, was that these small amounts of Sonsocuite seemed to contaminate the whole mass, and we had frequent base failures in consequence. Of course, the remedy is to waste all such small deposits whence they are encountered.

Some of the other volcanic materials, although appearing vitreous and apparently non-slaking have the ability to take up a great deal of water when disturbed, particularly the older badly weathered deposits. When the natural structure of these is destroyed by construction operations in the wet season they have little or no load bearing capacity. In their natural state and in the dry season they stand up satisfactorily but on manipulation in the wet season they break down to a plastic unstable slurry. This material was recently encountered in our operations in Costa Rica and occurs over a large area of the northern part of that country. It is hoped that with a little more experience with this material an economical means of using it will be developed.

We have trouble in finding hard, tough rock except by crushing river boulders that have come down from the high mountains. But we find usually plenty of porous lava which we do not hesitate to use for base.

The heaviest work encountered anywhere along the line in Central America was in Costa Rica where the highway crosses from the Central Plateau to El General Valley over a pass in the Talamanca range, which here forms the continental divide. For a distance of 40 kilometers the line is above the 8000 feet contour, and within a distance of approximately 114 kilometers rises from the Meseta at 3500 to Paso de las Muertes at 10932 feet and descends to El General Valley at San Isidro, elevation 2100 feet. For a distance of about 30 kilometers the excavation averaged 151,000 cubic meters per kilometer, and in kilometer 72 of that section the total was over 350,000 cubic meters. No heavier work on a two lane road is known to us for so long a section and it is probably exceeded only on the new four-lane road, about 12 kilometers long now being constructed between La Guayra and Caracas.

Two of the longest bridges in Latin America are along the route, one at the Lempa River in El Salvador and one at the Choluteca River in Honduras.

The Lempa crossing is a suspension bridge, 1,350 feet long, and the Choluteca bridge has two suspended spans and a total length of 880 feet.

No unusual methods of construction have been necessary because no great difficulties have been faced. Good job management and careful organization have sufficed at all times. Methods of work have varied and combinations not common with us have been resorted to, to meet known requirements and conditions of finance, location, problems of transport and delivery, local facilities in the National highway organizations, available equipment under war-time priorities and restrictions. We have built both roads and bridges by contract, by force account under the Bureau of Public Roads management and under local national management. Steel superstructures have been erected by contract on substructures built under separate contracts or under national or Bureau force account. Other bridges have been built entirely by contract. Hauling has been done in all possible ways, ranging from sea-going tugs and barges to airplanes.

Mechanization has been as varied as the organization of construction. Generally the introduction of machines has kept well ahead of the capacities of local and in most cases has required for a few months the use of American instructors until local labor could be trained. In such training we have had good success until at present work is generally mechanized.

It has been a conscious and large part of our supervisory and managerial responsibility in Latin America to train personnel in the use of mechanical equipment, because we know that maintenance of long sections and of difficult sections in the mountains will require mechanical methods; and because we wish to leave behind us trained operators who will be available for the inevitable extension of road systems in each country. Such additional road building has already begun in practically all the countries in which we have operated.

It has been necessary to maintain repair shops and camps, including in the latter general messes for both engineers and skilled labor and for common labor. Portable type camp buildings have been used because of frequent necessary shifts of camp sites. Beef has been purchased on the hoof, slaughtered as needed and refrigerated.

The extreme isolation of some of the construction camps and their distances from population centers depended upon to furnish common labor have made it necessary, in many cases, for us to operate mess houses for all labor. This has required extensive camp facilities, in some cases with large and elaborate kitchen and mess hall equipment. In every case where this has been necessary because of location difficulties, we have found it to be thoroughly justified on the additional grounds of hygiene, sanitation and efficiency. Much of the common labor in Central America is undernourished, not so much because of a food deficiency, but because of an unbalanced and inadequate diet. Two meals a day were provided for the common laborer and the response was almost immediate. The output per man, the turnover on the labor payrolls, and the willingness of common labor to work even on fiesta days have clearly demonstrated the advantage of providing what might be called a working diet. In addition to the general mess, many men have been furnished quarters as well and this arrangement also has been reflected in steadier operations and fewer changes in the payroll.

Our camps have generally been equipped with first aid facilities and a practical hospital orderly, potable water has been invariably provided by a suitable installation and latrines have been installed and supervised.

One of our considered purposes in connection with highway construction has been to develop personnel among the Nationals of the several countries

who may be depended upon later in maintenance organizations to furnish the necessary skilled equipment operators. We have trained survey men from rodmen up to the highest positions the men are capable of filling. We have trained equipment operators with gratifying success. On our largest job in Costa Rica under an American contractor during the days of pressure in the war years, we started with nearly 200 American operators and at the end of about fifteen months, this force of Americans was gradually reduced and replaced by Nationals on all the usual earth moving equipment and production continued slowly to rise. Bridge crews on both concrete and steel have been developed with good success and garage and machine shop mechanics have been trained to repair and overhaul all kinds of American equipment used on our jobs.

Except in Mexico, where assistance has been unnecessary, the United States Government has furnished both technical and financial aid. On the technical side we have pursued the same course of training Nationals suitably equipped, practically all of them graduates in engineering from American or European schools, just as described for skilled labor. After having had four Americans heading the bridge design section in Costa Rica, we now have a Costa Rican engineer trained in the States at the head of that section. We have had several materials engineers and two of our best locating engineers are Nationals of their respective countries.

With respect to the financing, the United States has provided funds from time to time to meet generally 2/3 of the cost of the individual projects. The cooperating country has paid 1/3. There has been provision for a limited amount of unmatched funds especially for use in Costa Rica where the length of the project and high costs within the National boundaries made it practically impossible for that small Republic to meet the costs. The total amount provided by the United States to date has been $41,100,000, which has been distributed over the years between 1930 and 1950, making the average amount available about $2,000,000 per year. The distribution is shown on the following table.

Funds appropriated to the Bureau of Public Roads or to the State Department for construction on the Inter-American Highway.

| Authorization | | |
|---|---|---|
| To the State Department | | Amount |
| Pub. 78, 71st Congress | 3-26-30 | $ 50,000 |
| Pub. 412, 73rd " | 6-19-34 | 1,000,000 |
| Pub. 723, 75th " | 6-25-38 | 50,000 |
| To the Bureau of Public Roads | | |
| Pub. 375, 77th Congress | 12-26-41 | $20,000,000 |
| Pub. 140, 78th " | 7-12-43 | 12,000,000 |
| Pub. 769, 81st " | 9- 7-50 | 8,000,000 |
| | TOTAL | $41,100,000 |

This financial assistance has been confined to Central America and Panama and as nearly as we can ascertain from the local records of those countries during the same period, they have expended $56,035,000 as distributed in an attached table.

December, 1951

ESTIMATED EXPENDITURES OF THE CENTRAL AMERICAN REPUBLICS
ON THE INTER-AMERICAN HIGHWAY

| COUNTRY | EXPENDITURES BY REPUBLICS UNDER $1,100,000 APPROPRIATIONS TO STATE DEPT. | EXPENDITURES REPORTED BY REPUBLICS AS OF MAY 1951 (EXCLUSIVE OF COOPERATIVE EXPENDITURES) | ESTIMATED EXPENDITURES BY REPUBLICS WHEN $20,000,000 FUND IS SPENT | ESTIMATED ADDITIONAL EXPENDITURES BY REPUBLICS TO COMPLETE I. A. H. | TOTAL |
|---|---|---|---|---|---|
| GUATEMALA | 132,161 | 3,801,601 | 3,000,000 | 6,267,335 | 13,201,097 |
| EL SALVADOR | ---- | 4,321,930 | 680,000 | 256,000 | 5,257,930 |
| HONDURAS | 231,978 | 419,301 | 1,025,000 | 1,871,330 | 3,547,609 |
| NICARAGUA | 81,700 | 2,958,750 | 1,474,900 | 2,910,335 | 7,425,685 |
| COSTA RICA | 57,740 | 3,172,641 | 2,800,000 | 1,000,000 | 7,030,381 |
| PANAMA | 163,894 | 12,254,832 | 265,000 | 6,889,000 | 19,572,726 |
| TOTALS | 667,473 | 26,929,055 | 9,244,900 | 19,194,000 | 56,035,428 |

If we include the reported expenditures of Mexico on the independent construction in that country, the total expenditure by all of the countries south of the Rio Grande to the Panama Canal zone will amount to approximately $100,000,000.

The total length of the Inter-American Highway from the Rio Grande at Laredo, Texas, to the Canal Zone is approximately 3,200 miles or almost the same as the distance from New York to San Francisco. The requirement of joint financing and of working cooperatively with six different countries; the eventualities of a wide-spread commercial depression and a world at war have made over-all progress inevitably slow. The average annual contribution of the United States has amounted to only two million dollars providing a joint fund of three million dollars annually. Nevertheless, the work has gone forward in Mexico since 1926 until its completion in 1951 at the Guatemala frontier; and in Central America with approximately 1,650 miles of road, the work has been advanced until today there remain three impassable gaps amounting to less than 8% of the total distance. These gaps consist of approximately 20 miles in Guatemala immediately adjacent to the Mexican border, a section in northern Costa Rica approximately 100 miles long and another in southern Costa Rica approximately 120 miles long, including a short section of 15 miles on the Panama side of the common frontier. With the opening of about 250 miles to traffic the road will be made passable from the United States to the Panama Canal Zone.

At the present time 65% of the entire route from the Rio Grande to Panama is paved principally with the standard six meter bituminous surfacing which prevails on the Inter-American Highway. 28% additional is passable in all weathers. Less than 1% is passable only in the dry season and 7% remains at this date impassable. The following table shows the conditions in each country.

SUMMARY OF
CONDITION OF THE INTER-AMERICAN HIGHWAY
AS OF JUNE, 1952

| | MILES | | | | |
|---|---|---|---|---|---|
| | PAVED | ALL WEATHER | DRY WEATHER | IMPASSABLE | TOTAL |
| MEXICO | 1492 | 114 | --- | --- | 1606 |
| GUATEMALA | 45 | 264 | --- | 25 | 334 |
| EL SALVADOR | 174 | 21 | --- | --- | 195 |
| HONDURAS | 0 | 94 | --- | --- | 94 |
| NICARAGUA | 132 | 106 | --- | --- | 238 |
| COSTA RICA | 60 | 141 | 14 | 198 | 413 |
| PANAMA | 156 | 146 | --- | 14 | 316 |
| TOTAL | 2059 | 886 | 14 | 237 | 3196 |
| PER CENT | 65 | 28 | under 1 | 7 | 100 |

## CONDITION OF THE INTER-AMERICAN HIGHWAY AS OF JUNE, 1952

| LOCATION | LENGTH Miles | ACCUMULATED LENGTH Miles | CONDITION |
|---|---|---|---|
| **MEXICO** | | | |
| Nuevo Laredo | | 0 | |
| | 765 | | Paved |
| Mexico City | | 765 | Paved |
| | 727 | | |
| San Cristobal Las Casas | | 1492 | |
| | 114 | | |
| Guatemala border | | 1606 | All Weather |
| TOTAL MEXICO 1606 Miles | | | |
| **GUATEMALA** | | | |
| Mexican border | | 0 | |
| | 25 | | Impassable |
| Kilometer 303 | | 25 | |
| | 76 | | All Weather |
| San Cristobal | | 101 | |
| | 89 | | All Weather |
| Sumpango | | 190 | |
| | 23 | | Paved |
| Guatemala City | | 213 | |
| | 14 | | Paved |
| Kilometer 22 | | 227 | |
| | 78 | | All Weather |
| Asunción Mita | | 305 | |
| | 8 | | Paved |
| Kilometer 160 | | 313 | |
| | 4 | | All Weather |
| El Salvador border | | 317 | |
| Spur San Cristobal | | | |
| to Quezaltenango | 8 | | All Weather |
| to Totonicapan | 9 | | All Weather |
| TOTAL GUATEMALA 334 Miles | | | |
| **EL SALVADOR** | | | |
| Guatemala border | | 317 | |
| | 60 | | Paved |
| San Salvador | | 377 | |
| | 110 | | Paved |
| Sirama Y | | 487 | |
| | 21 | | All Weather |
| Honduras border | | 508 | |
| | 4 | | Paved |
| Spur Sirama Y to La Union | | | |
| TOTAL EL SALVADOR 195 Miles | | | |
| **HONDURAS** | | | |
| El Salvador border | | 508 | |
| | 25 | | All Weather |
| Jícaro Galán | | 533 | |
| | 69 | | All Weather |
| Nicaraguan border | | 602 | |
| TOTAL HONDURAS 94 Miles | | | |
| **NICARAGUA** | | | |
| Honduras border | | 602 | |
| | 85 | | All Weather |
| Sébaco | | 687 | |
| | 61 | | Paved |
| Managua | | 748 | |
| | 71 | | Paved |
| Rivas | | 819 | |
| | 21 | | All Weather |
| Costa Rica border | | 840 | |
| TOTAL NICARAGUA 238 Miles | | | |
| **COSTA RICA** | | | |
| Nicaragua border | | 840 | |
| | 64 | | Impassable |
| Bagaces | | 904 | |
| | 14 | | Dry Weather |
| Las Cañas | | 918 | |
| | 70 | | All Weather |
| San Ramón | | 988 | |
| | 46 | | Paved |
| San José | | 1034 | |
| | 14 | | Paved |
| Cartago | | 1048 | |
| | 71 | | All Weather |
| San Isidro | | 1119 | |
| | 134 | | Impassable |
| Panamá border | | 1253 | |
| TOTAL COSTA RICA 413 Miles | | | |
| **PANAMA** | | | |
| Costa Rica border | | 1253 | |
| | 14 | | Impassable |
| Concepción | | 1267 | |
| | 146 | | All Weather |
| Santiago | | 1413 | |
| | 156 | | Paved |
| Panama City | | 1569 | |
| TOTAL PANAMA 316 Miles | | | |
| GRAND TOTAL: 3196 Miles | | | |

When the Pan American Highway system was originally projected, the anticipated long time results were undoubtedly prompted by enlightened selfishness. The Government of the United States in lending technical aid in South America and technical and financial assistance throughout Central America and Panama believed that commercial, economic, and political conditions in the hemisphere would be improved. On the economic side, the common indices of progress in Central America alone indicate unusual and almost unexpected progress. Considering the central country of the group, Nicaragua, a few figures indicate the remarkable changes which have occurred. In 1940 exports amounted to approximately ten million dollars, in 1950 they reached forty million dollars. Imports in 1940 were also about ten million; in 1950 they were thirty-two million dollars. The motor vehicle registration in 1940 was 254, in 1950 it was 3,500. There were only 6 farm tractors in the country in 1940, in 1950 there were 1200.

In northern Costa Rica where a long unimproved gap exists there were practically no modern farm implements until the line of the road was determined. With that section still unimproved but in anticipation of a good road over 20 agricultural tractors entered the area before construction was started and practically 100 are in use there today while work is in progress on the road.

Local international trade in the Isthmian area which practically did not exist at the time of the reconnaissance now has become systematic between some countries. Cotton goes from the Nicaraguan fields to the textile mills in El Salvador and, strange as it may appear, "bottled gas" goes from Salvador to Nicaragua. A regular lumber trade exists from Honduras to El Salvador and the cattle trade, formerly irregular, sporadic, and at great loss in weight, is now regular and on a much more profitable basis.

One of the most interesting details in local development has occurred in El General Valley in southern Costa Rica. The Valley was, at the time of the reconnaissance, practically isolated from the rest of the country. When Shunk, the engineer heading the Inter-Continental Railroad Survey in 1890 pushed his reconnaissance through southern Costa Rica, he avoided the Valley because of the difficulties of entering it and carried his line along the coast. In his report he stated that the potentialities of the inter-mountain valley were so great that before a final line was selected, further study should be made in an effort to penetrate the region. When our reconnaissance party crossed the mountains from the little town of San Isidro at the head of the valley to the Meseta Central at Cartago, they were ten days on the mountain trail over the Cerro de los Muertes. When the survey party first followed through on the reconnoitered trail 12 years later, it took them five days. In 1944, the road was opened between the capital city, San José, and the town of San Isidro, a distance of approximately 72 miles. My last trip over the road required only three hours. In this distance the road climbs from approximately 3,400 ft. elevation at Cartago to 10,932 ft. at the crest of the pass in the Talamanca Range and descends to an elevation of 2,200 ft. at San Isidro. When construction was started on this section in 1941, San Isidro was a small barrio of approximately 250 people. It had no school or adequate water supply. Today busses and trucks operate between San Isidro and San José; the population of San Isidro is approximately 3,000; there is a school, a small hospital and a potable water supply. A Catholic Priest assigned to the parish in that area has reported that within the last ten months he has baptized 8,000 children within a radius of ten miles of San Isidro. I leave you to fit these figures into the picture as seems to you most

appropriate. San Isidro is at the north end of the Valley, which has a variable width of from 5 to 20 miles and is approximately 80 miles long. The town is at the north end of the presently impassable gap on the road in southern Costa Rica. With the completion of the road through this area, the potential development of the Valley and its effect on the economy of Costa Rica can hardly be estimated. It is an outstanding example of conditions which may be expected throughout the route as isolated areas are opened to agricultural and commercial development.

With only 250 miles still to be opened, it would be difficult to see how such a project, with so large a past investment and so extended a future advantage could, at this stage and under present conditions, be left incomplete.